Jason Dive 268 Summary – EPR ISS Infrastructure Dive (D.J. Fornari & S.A. Soule)

The objectives of Dive 268 were to conduct several types of surveys to provide baseline data that would be useful to a broad cross-section of multidisciplinary investigations at the EPR ISS. The primary tasks were to: 1) install navigational benchmarks at key areas where experiments and high- and low-temperature vents are located (Fig. A); 2) survey-in the benchmarks using long-baseline (LBL) acoustic data and reference them to the experiment sites and high-temperature vent sites; 3) conduct low altitude (3-4 m) surveys across the axial summit trough (AST) over the benchmark areas; 4) collect high resolution, near-bottom multibeam and magnetic data over the benchmark areas and attempt to survey between benchmark areas to provide a broader context of AST morphology and bathymetry for current and future EPR ISS experiments; 5) attempt recovery of three ocean-bottom seismometers (OBSs) that were trapped by lava from the 2005-2006 eruptions; 6) collect additional samples and observations of the 2005-2006 lava flow, especially in areas where the flow advanced within lava channels and extended furthest from the source vents in the AST, and 7) recover a lost compliance meter from the Webb/Cormier et al. experiment that failed to acoustically release during AT15-16 (Fig. B).

Figure A. Photos of Jason2 and elevator prior to Dive 268. Upper left photo shows benchmark design, upper-right photo shows arrangement of Benchmarks 1&2 on basket along with sample basket prior to launch. Lower left shows syntactic float packs rigged on swing arms. The float packs were attached to the OBSs to provide additional buoyancy. Lower right photo shows elevator rigged with additional benchmarks (foreground) and sample basket in wooden box (background).

Given the along axis area to be covered during the dive, between ~ 9° 49'-51'N (Fig. B), the logistics for Dive 268 required deploying an elevator to the seafloor to carry additional benchmarks that were to be installed after Benchmarks 1&2, as well as additional sample bins to

collect lava samples. The elevator was deployed prior to the dive and surveyed in using LBL from the ship; it landed ~ 200 m west of the Tica vent site. The start of operations were advanced by ~12 hours by the generous donation of ship time by the PIs of the 9 03'N OSC program - Klein, White, Perfit, Von Damm - who had completed their survey work 12 hrs early.

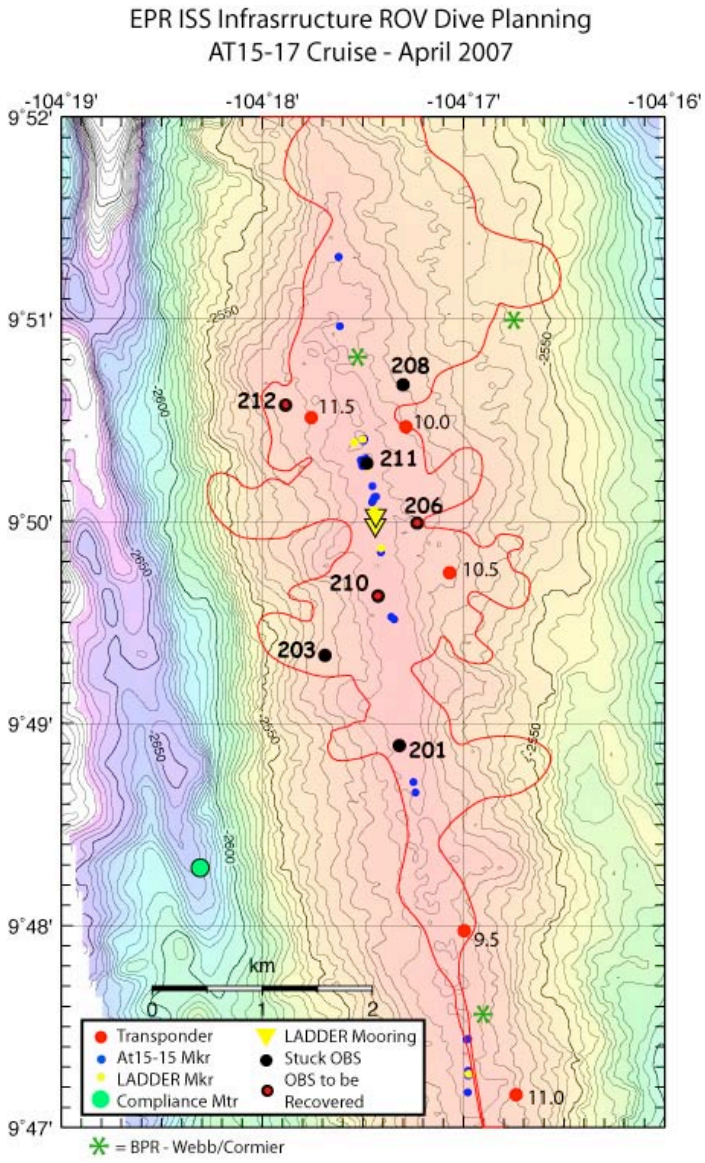


Figure B. Summary of locations of key experiments and instruments, as well as 5 of the 6 permanent acoustic transponders currently deployed at the EPR ISS (another transponder, 11.5 kHz - is ~2 km south of the 11.0 kHz near 9 46'N). The red line on the map is the most recent limit of the 2005-2006 EPR lava flows from an analysis of ~150,000 TowCam images collected since May 2006 to Jan. 2007 [Soule et al., submitted].

An operational summary for Dive 268 is shown in Table 1. We started in the northern portion of the field area and worked south, given the locations of OBS212 and the compliance meter to be recovered. The main tasks for the dive are discussed in five separate sections and include: Benchmark surveys, SM2000 near-bottom multibeam surveys and low-altitude transects, OBS and compliance meter recoveries, hiT vent observations, lava channel mapping and sampling.

18 April, 2007 Z

0600	Launched Jason2 for Dive 268
0745	On bottom searching for OBS 212
0820-0834	SM2000 Calibration lines
1220	Located OBS212
1415	OBS212 on deck
1517-1628	Traverse & sampling up lava channel west of AST from OBS212 site
1748	Benchmark 1 deployed
1756-1821	Benchmark 1 LBL survey
1823-2005	Benchmark 1 across AST SM2000 surveying
2009	Transit from Benchmark 1 to OBS206 site
2200	Located OBS206
2250	OBS 206 released

19 April, 2007 Z

0015	OBS 206 on deck
0020	Heading to Benchmark 2 site
0204	Benchmark 2 deployed
0209-0224	Benchmark 2 LBL survey
0302	At elevator to switch baskets and get other benchmarks
0702	Benchmark 3 deployed
0714-0730	Benchmark 3 LBL survey
0743-1259	Benchmark 2&3 across AST SM2000 surveying
1302	Transit to Benchmark 4 site
1423	Benchmark 4 deployed
1440-1455	Benchmark 4 LBL survey
1531-1745	Benchmark 4 across AST SM2000 surveying
1747	Start transit to OBS 210 site
1850	At OBS210, attempting excavation of instrument
2015	Leaving OBS210 site, not recoverable
2025	Start of long N-S AST SM2000 surveying between 9° 50'-51'N– 6 lines

20 April, 2007 Z

0831	End of long N-S AST SM2000 surveying
0902-1850	Mapping and sampling of long lava channel east of AST at 9° 51'N
1900-2200	Transit from end of lava channel to elevator, switch baskets and release
2220	Elevator released
2305-2320	Resurvey of Benchmark 2 using LBL

21 April, 2007 Z

0030	Elevator on deck
0030-0230	Visual observations at Bio9, P and Ty/Io high-T vent areas
0325-0358	Resurvey of Benchmark 4 using LBL, 2 collections using 2 transponder pairs
0419	Setting up SM2000 survey of AST between 9 49.5'-49.8'N, south of LADDER moorings
0437-0749	SM2000 survey of AST south of LADDER mooring
0757	Start of transit to compliance meter
1025	At compliance meter
1053	Compliance meter released
1302	Compliance meter on deck, Jason2 coming up.
1353-1411	Magnetometer spins at 1200 m – 3 turns each in both CW and CCW directions
1518	Jason 2 on deck, commence transit to San Diego

Table 1. Operational summary of Jason2 Dive 268**.**

Benchmarks

Four benchmarks were installed and surveyed-in during Dive 268. The locations were determined based on proximity to high-T vent sites and ongoing biological experiments at diffuse flow vents in the area (Figs. C and D). The procedure for installing the benchmarks involved locating the associated vent sites and then determining which side of the AST rim to best place the benchmark based on the terrain. Areas of extensive collapse proximal to the AST wall were avoided. Benchmarks were deployed by Jason2 and the milk crates that form the base of the benchmark were weighted with additional rocks from the surrounding flow. The ROV was positioned with the benchmark at the front of the basket and the vehicle heading 000°. Once Jason LBL navigation was consistent we commenced 15 minutes of LBL data collection with the vehicle sitting on the bottom and not moving (Table 2).

Benchmark #1 LBL Survey – April 18, 2007

1756 **Start recording LBL data while sitting at Benchmark #1 for 15 min with Jason heading 000° and benchmark at middle of basket**

1821 **End recording LBL at Benchmark #1, reset Doppler to Jason LBL**
Preliminnary position from renav is: 9° 50.981'N 104° 17.666'W, X=4274 Y=79225, Depth 2504m

Benchmark #2 LBL Survey – April 19, 2007

0209 **Start collecting 15 minutes of LBL fixes at Benchmark #2.**

0224 **End LBL data collection for 15 minutes at Benchmark #2**
Preliminnary position from renav is: 9° 50.401'N 104° 17.473'W, X=4627 Y=78157, Depth 2501m

Benchmark #2 LBL Survey – April 20, 2007

2305 **Jason1 LBL nav back on and collecting data while in position at Benchmark #2**

2320 **End LBL nav collection at Benchmark #2**
Preliminnary position from renav is: 9° 50.409'N 104° 17.478'W, X=4619 Y=78171, Depth 2501m

Benchmark #3 LBL Survey – April 19, 2007

0714 **Start collecting LBL data while sitting at Benchmark #3 site with J2 at 000 heading and benchmark at front of basket**

0730 **End LBL data collection at Benchmark #3 site.**
Preliminnary position from renav is: 9° 50.308'N 104° 17.464'W, X=4643 Y=77986, Depth 2501m

Benchmark #4 LBL Survey – April 19, 2007

1440 **Start 15 min LBL recording at Benchmark #4 with Jason2 oriented 000 and benchmark at front of basket.**

1455 **End recording of LBL at Benchmark #4**
Preliminnary position from renav is: 9° 50.126'N 104° 17.428'W, X=4710 Y=77650, Depth 2503m

Benchmark #4 LBL Survey – April 21, 2007

0325 **Started collecting LBL data at Benchmark #4 using B/C pair (10.0/10.5)**

0342 **End LBL data collection at Benchmark #4 with B/C pair**

0343 **Started collecting LBL data at Benchmark #4 using A/B pair (11.5/10.0)**

0358 **End LBL data collection at Benchmark #4 with A/B pair**

Table 2. EPR ISS benchmark survey times and preliminary locations. *These data should **NOT** be used for final positions of the benchmarks*. Post-cruise processing/analysis of the data are required to establish final surveyed positions for each benchmark that is integrated with SM2000 bathymetry.

Navigation data, including raw travel times from the three primary transponders used for all the Dive 268 operations, are included in the original data disks for the AT15-17 cruise. The information includes raw travel time data for the transponder surveys that were done in 2006 on the AT15-6 and AT15-13 cruises in June and November, respectively. Post processing of LBL data for the Benchmark surveys and analysis of the data will be required to properly calculate the best positions for each benchmark. **The positions listed in Table 2 should be considered preliminary.**

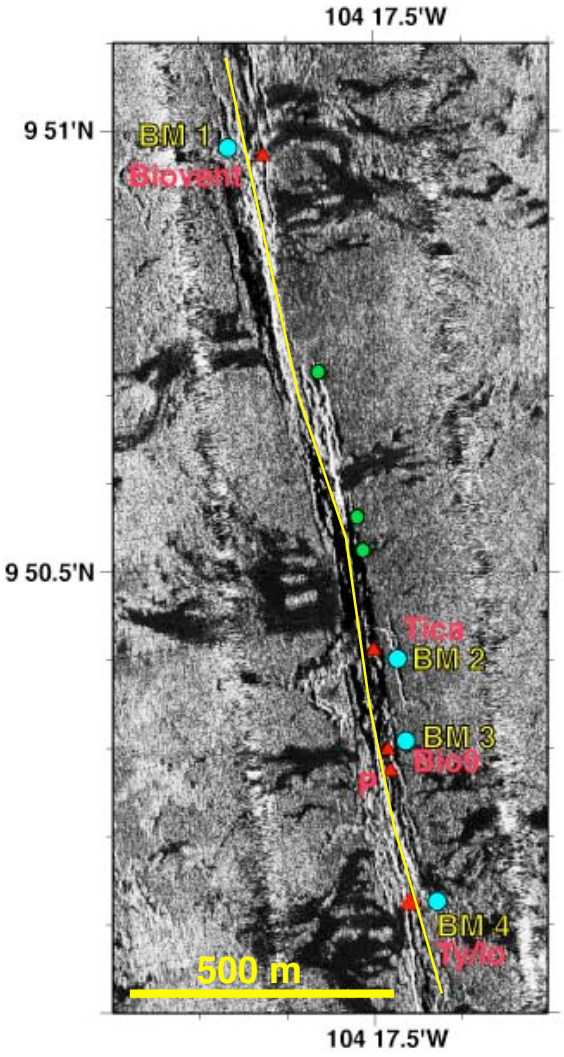


Figure C. Map showing locations of EPR ISS benchmarks and high-T vents (red triangles) and low-T diffuse flow areas (green dots) overlaid on new DSL-120a sidescan sonar collected during AT15-17, March, 2007 (S. White and S.A. Soule). Dark, dendritic patterns on sidescan image are low reflectivity lava channels emanating from the AST (thin yellow line shows trace) that formed during the 2005-2006 eruptions.

SM2000 surveying

Surveying using the 200 kHz near-bottom multibeam system on Jason2 (SM2000) was conducted to produce detailed topographic maps that could be used for establishing digital elevation models of the AST, and specific experiment areas where studies at the ISS are being carried out (Figure D). Once processed, these data can provide a topographic baseline along the AST to be used to measure changes caused by subsequent eruptions or tectonic events. These data will augment the physical benchmarks deployed and surveyed during the dive.

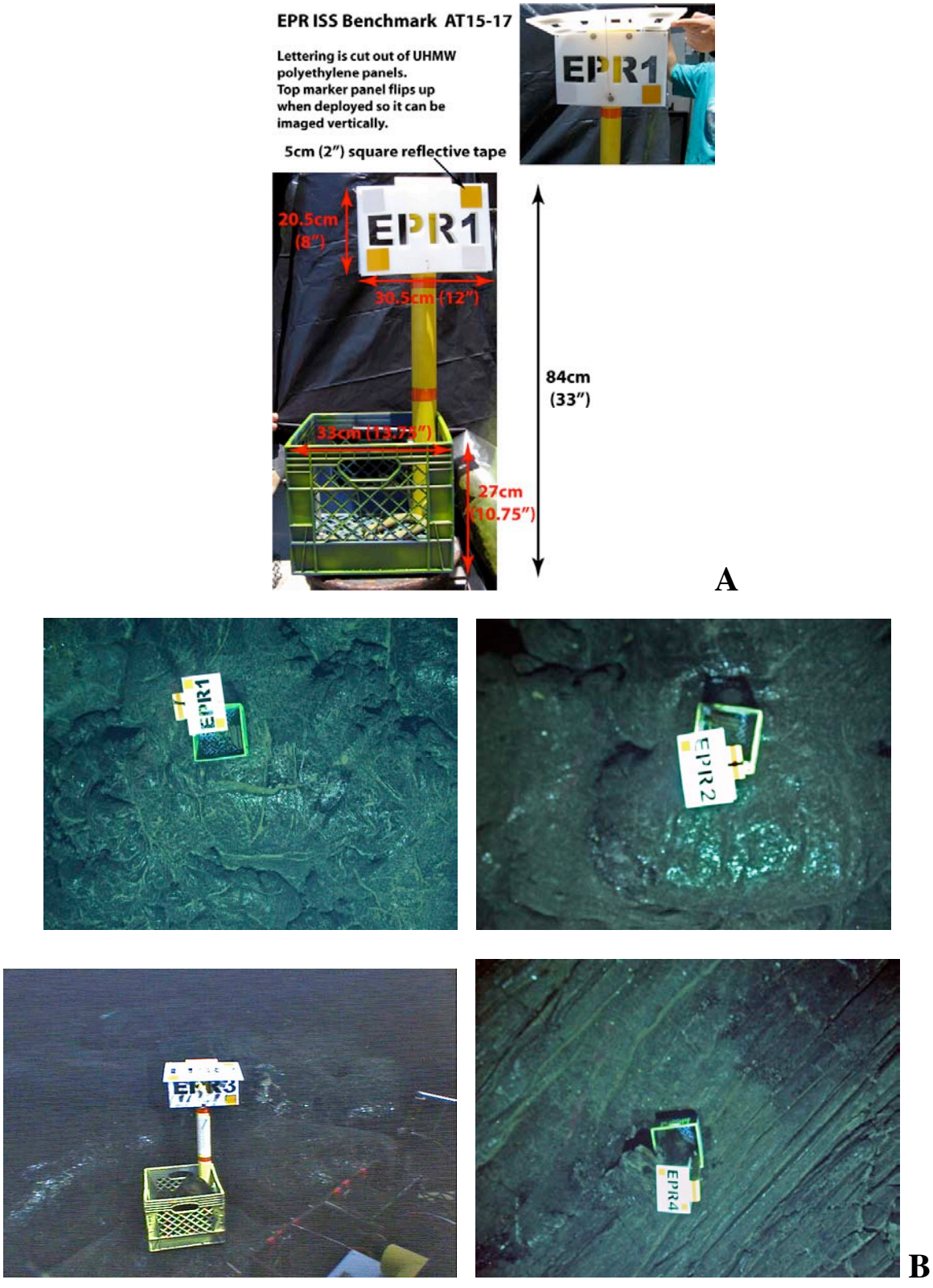


Figure D. A) Dimensions of EPR ISS Benchmarks. B) Digital photographs taken from Jason2 of the four EPR ISS Benchmarks installed during Dive 268.

The SM2000 sensor was calibrated soon after arriving on bottom by running 3 lines over the same terrain on reciprocal headings at 5, 10 and 15 m altitudes. For all of the across-AST and along-AST surveys, the ROV was run in 'constant depth' closed-loop control –meaning the vehicle depth was kept at 2490 m and the seafloor allowed to rise and fall beneath it while

traversing the seafloor. This depth was determined after several crossings of the AST and establishing that we would not loose bottom-lock with the 1200 kHz DVL Doppler on Jason2 that has a maximum range of 30 m, but a practical range of ~ 20-25 m. Throughout the surveys, bottom lock was maintained except for very sporadic intervals when there were only 3 beams or momentary loss of bottom lock. This occurred when we recovered OBSs and the elevator during the dive, the ROV had to rise off the bottom by ~100 m to permit the ship to maneuver safely during recovery operations and when samples were collected and we were too close to the seafloor. During those times bottom lock was lost but it was re-established prior to commencing subsequent surveys.

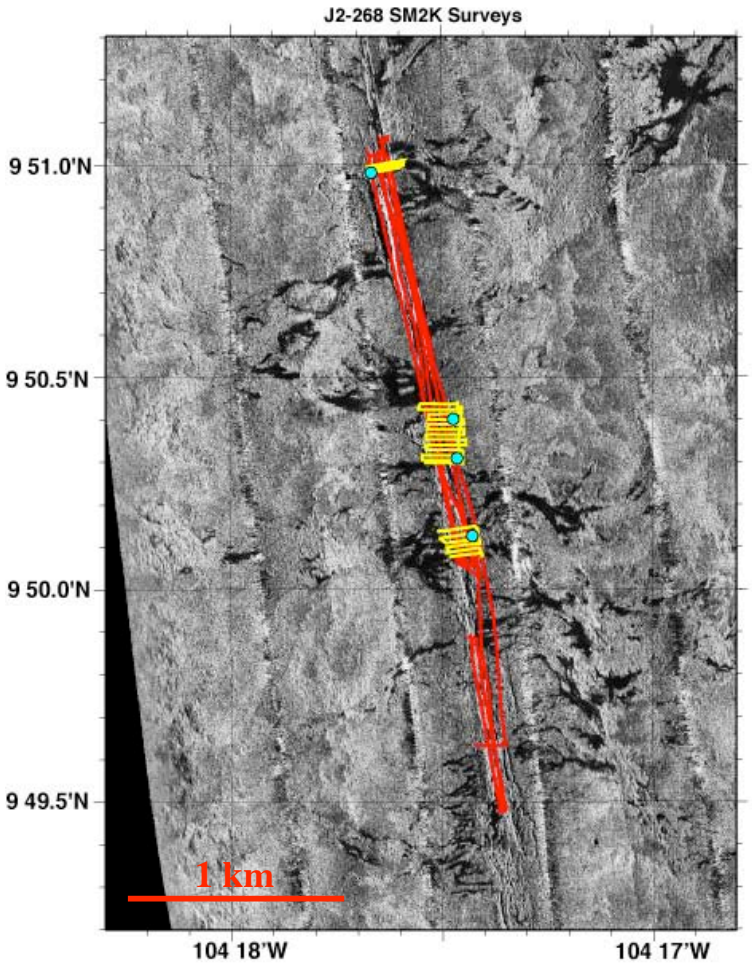


Figure E. Map showing locations of EPR ISS benchmarks (blue dots) and SM2000 near-bottom bathymetry surveys (yellow and red tracks) overlaid on new DSL-120a sidescan sonar collected during AT15-17, March, 2007 (S. White and S.A. Soule). Dark, dendritic patterns on sidescan image are low reflectivity lava channels emanating from the AST that formed during the 2005-2006 eruptions.

Figure E shows the locations of primary SM2000 surveys. Within each benchmark site across-AST areas each ~150 m wide by ~100-200 m long (N-S) were surveyed. The across-AST survey between Benchmark 2 and 3 was done continuously as these two areas are prime sampling and observational sites. In order to tie together the 4 benchmark areas, long N-S oriented SM2000 survey lines were run to completely map the AST over ~ 2 km. Data density and control should be excellent within the benchmark areas given the multiple crossings. Preliminary processing was done at sea on ROV navigation and processing/display of SM2000 data. See Appendix 2 for processing notes by C. Sellers and preliminary images of data.

OBS and compliance meter recoveries

An important objective of the dive was to attempt recovery of the 3 OBSs that were still communicating acoustically but found to be trapped in the 2005-2006 lava flows [Tolstoy et al., 2006; Cowen et al., 2007] based on direct observations from the fiber optic TowCam during the June 2006 AT15-6 event response cruise and Alvin during AT15-15. Figure F shows a map of the OBS locations over the new sidescan imagery. Figure G shows Jason2 video camera frame grabs of the recovery operations for OBSs 212 and 206, and the attempted recovery of OBS 210. Figure H shows photographs of the recovered OBSs on deck, and Figure I shows images of the compliance meter.

The two recovered OBSs were both trapped by hackly lava flows that clearly compromised the anchors and release assemblies, and partially buried the floatation sphere hard-hats. Because the hackly flow was quite broken up in both cases, the OBSs were easily pulled from the flow after each syntactic float pack was attached to the lift bail. For OBS 212 the frame was partially buried and a large rock was wedged between the pressure housings. Once that was cleared and the frame shaken so that the lava rubble fell off, it was clearly observed to be buoyant and was released. The same was true for OBS 206, which also was easily pulled from the hackly flow, shaken to be sure no large pieces of lava were trapped inside the base, and then released. The additional ~12# of syntactic floatation helped the OBSs rise quickly at ~ 35 m/min. In all cases the ship was used to recover the instruments. Given the calm weather and rapid ascent speed, minimal time was lost in having Jason2 off the bottom during recoveries. In some cases sampling or other operations were done during portions of the OBS ascent. The OBSs were washed with fresh water after recovery and placed under a tarp for offloading in San Diego at SIO-MARFAC. The acoustics were disabled when they were on the surface using the ORE deck box left by the WHOI buoy group.

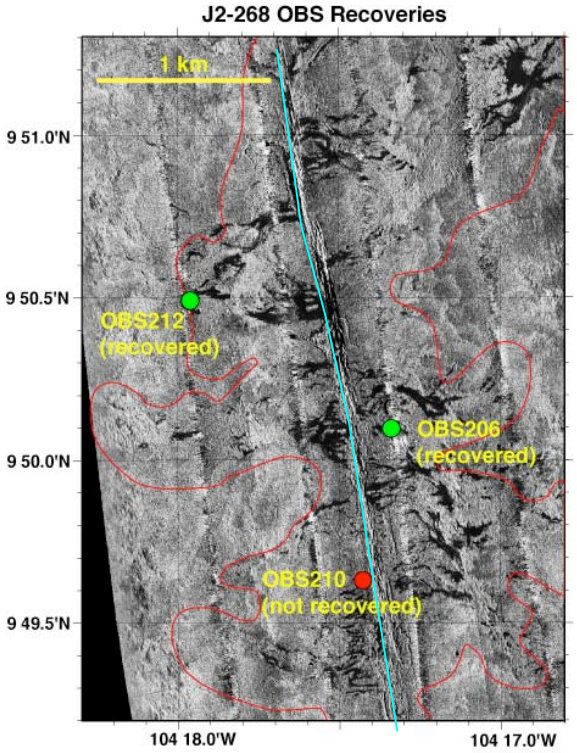
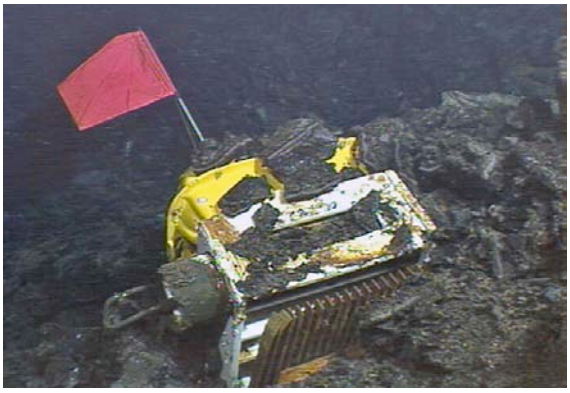
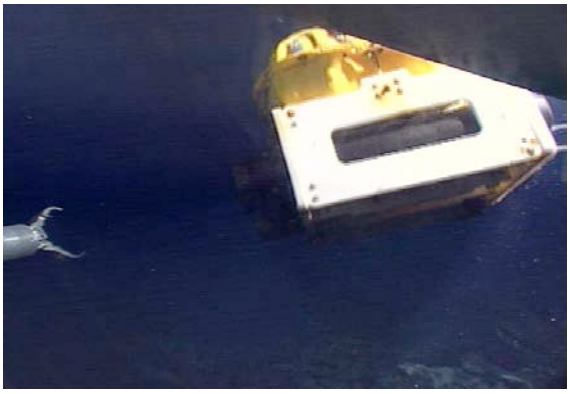


Figure F. Map showing locations of OBS recoveries on AT15-17, Jason2 Dive 268 plotted over the new DSL-120a sidescan sonar data collected during AT15-17, March, 2007 (S. White and S.A. Soule). Thin red line is the limit of the 2005-2006 lava flows mapped using TowCam data [Soule et al., submitted]. Thin blue line shows trace of AST. Dark, dendritic patterns on sidescan image are low reflectivity lava channels emanating from the AST that formed during the 2005-2006 eruptions.

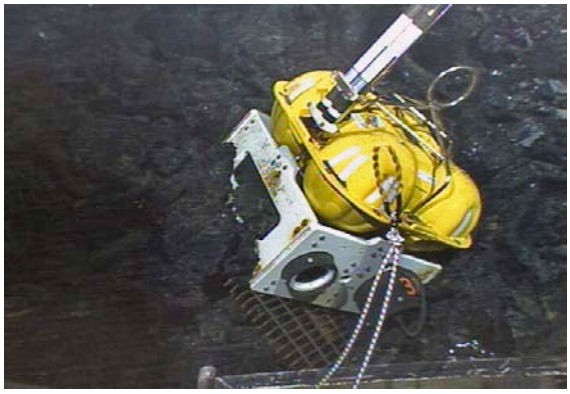


OBS212 site

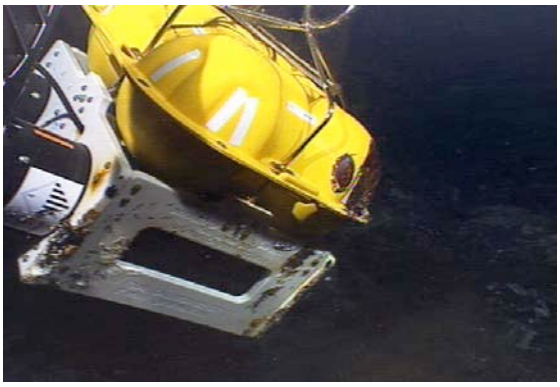
OBS212 rock on pressure housings



OBS212 released

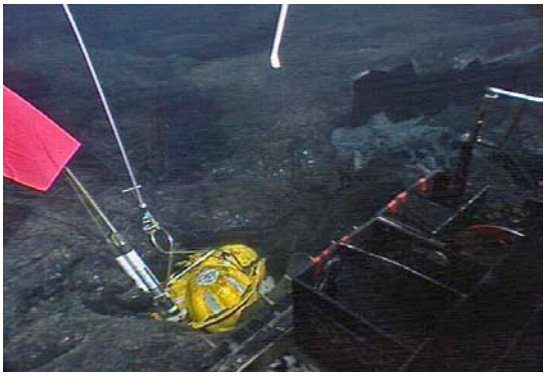


OBS206 site



OBS206 scorched plastic frame

OBS206 anchor buried in lava - after release



OBS210 site

OBS210 after trying to clear lava flow

Figure G. Jason2 photographs of OBS recovery operations undertaken during dive 268.

OBS210 was considerably more buried by the new lava and the flow around it was a lobate flow rather than the hackly lava found at OBS 212 and 206 sites. While the area to either side of OBS210 comprised lobate crust that was partially collapsed, the OBS itself was situated over what appeared to be a small lava pillar. The base of the OBS was completely buried and proved impossible to dislodge, despite considerable attempts to break through the surrounding lava using Jason2 to break up lava crusts and clear the debris using the manipulators. It may be possible with a dedicated 24-36 hr dive and the proper manipulator tools to clear enough rubble away from the OBS to dislodge it, but it was clearly not possible within the time we had available, and the manipulator capabilities. In addition, the seismometer pressure housing appeared to be filled with lava, although it was difficult to determine whether it was fragmental debris or in-place lava, suggesting that of the three OBSs, 210 is the most likely to have been compromised by the eruption.


A


B

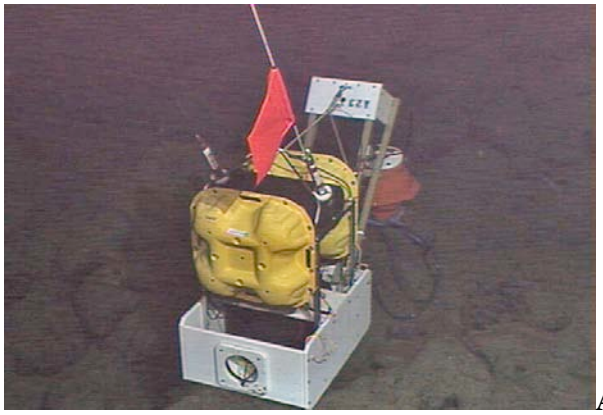

C


D

Figure H. Photographs of recovered OBS 212 on deck. A) OBS 212 on the surface. Syntactic float block is at right. B) OBS 212 being landed on deck. C) Recovering glass from inside OBS 212. D) Electronics housing of OBS 212 showing partially melted plastic cowling and frayed cable.

The compliance meter lost on AT15-16 (Webb/Cormier et al.) had been well surveyed when it failed to return to the surface so was easily located at the end of Dive 268. It was found on sediment covered lobate lava flows in a normal attitude. On inspection, neither weight had released so both burn wires were cut using a knife tool and the ROV manipulator. One weight was observed to fall out and the other weight was not observed when we turned the instrument partly on its side. The instrument appeared to be buoyant so it was released. In hindsight, we should have cleared the other weight cover to ensure that the weight had in fact dropped as the instrument surfaced very slowly and took over 2 hrs to reach the surface. It was recovered normally and washed down. With instructions from Webb, the instrument was dismantled, the sensor disconnected from the electronics and packed for shipment. The Li batteries were

removed from the electronics case and the acoustics were turned off. All cables were washed and the unit was readied for shipment on arrival in San Diego. Figure I shows the instrument on the seafloor and recovered on deck.


A


B


C

Figure I. A) Compliance meter on the seafloor as observed by Jason on Dive 268. B) Manipulating instrument frame to release weights. C) Compliance meter on deck on R/V Atlantis.

Hi-T vent observations

Time was spent during the dive making observations at four high-T vent sites within the ISS bull's eye – Bio9, P, Ty and Io vents. This was done in order to both site the benchmarks as well as collect images for use in characterizing the vent areas. Some of the time was also spent making observations in the AST in the areas immediately surrounding the vents to characterize the terrain and establish relative distances between vents like Ty and Io that are only ~8 m apart, and the surrounding complex structure in the AST floor and adjacent walls. In addition, we conducted low-altitude imaging over the vents where possible although the downlooking digital still camera on Jason2 did not focus properly at times and the strobe used was only 300 watt/sec output so some of the images are dark. Hopefully, further downlooking imaging can be done on subsequent Alvin dives in late 2007-2008 to collect additional data that can be merged with the high-resolution SM2000 bathymetry.

Lava channel mapping and sampling

We conducted two across-axis channel transects with the objectives of ground-truthing acoustic textures in the DSL120a sidescan sonar imagery and collecting samples that reflect a temporal sequence of the down-flow progression of the lava (Figure J). Transect locations were selected to cover the most interesting features observed in the new sonar data and were coordinated with the surveying objectives of the infrastructure dives. We used lava channels imaged in the AT15-17 DSL-120a sidescan data to constrain flow pathways and to ensure that sampling was conducted along unique flow paths. Samples were collected at ~250 m spacing along each transect.

Transect A, west of the AST, began at 9°50.5'N and followed a bearing of ~050° for ~0.9 km, from near OBS212 to the AST (Figure J). We started the transect at the location of OBS212, which was trapped in a hackly flow. The channel, which defines the path of the lava flow, is discontinuous, and often times interrupted by areas of hackly, broken lava crusts within which remnants of the smooth sheet flows can be seen. The lava channel itself comprised flat sheet flows that contained lineations striking NE. The channel margins comprised hackly flow that graded into lobate flows along either margin. A total of five samples were collected along the transect from a variety of flow morphologies. The total elevation change along the transect was 15 m.

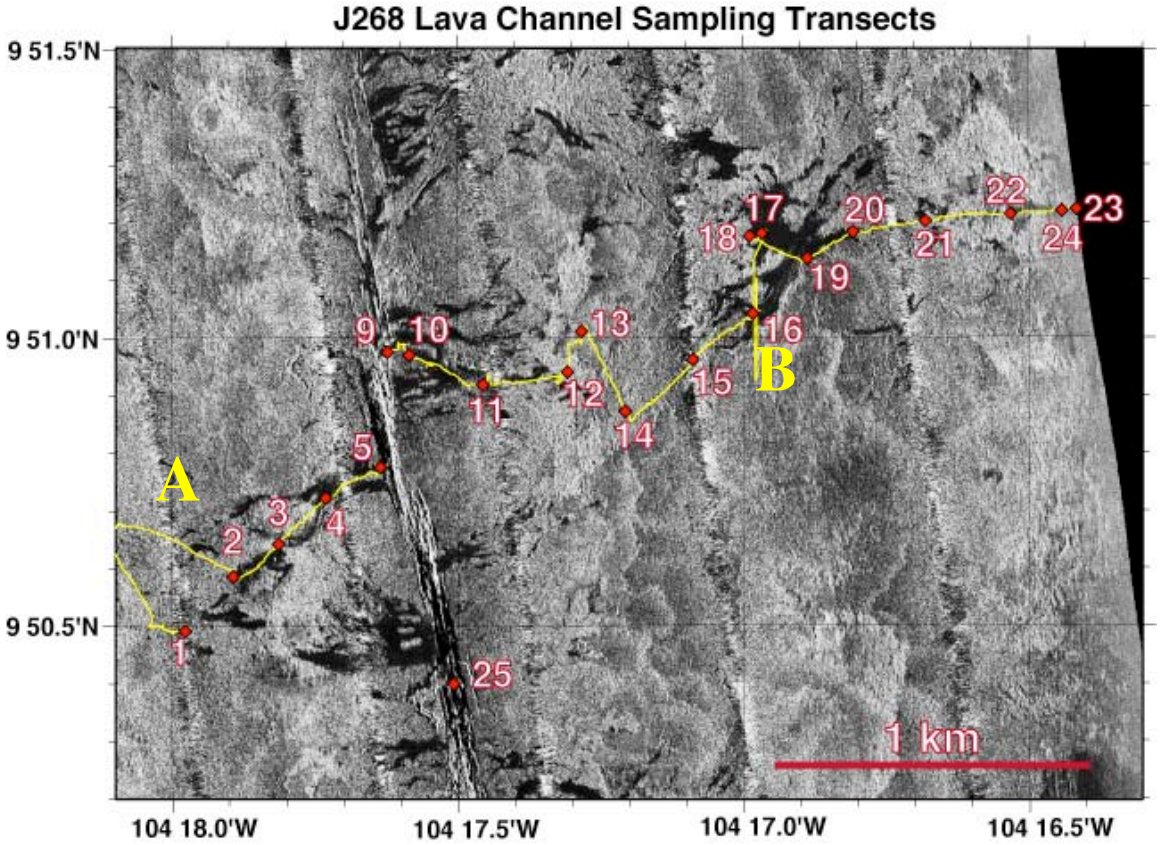


Figure J. Map showing locations of lava samples collected during Jason Dive 268 from two lava channels between 9° 50.5'-51.3'N, west (Transect A) and east (Transect B) of the AST. Sample 1 was collected ~1 m from OBS212 and Samples 6 and 8 (not shown) were collected next to OBS 206 and 210 respectively. Samples 7 was not recovered. In addition, glass was collected from inside OBS212. Samples from OBS 212 and OBS206 have been processed and will be sent to K. Rubin (U. Hawaii) and M. Perfit (U. Florida) for geochemical analyses and Po dating.

Transect B, on the east ridge flank, began at the AST at 9°51'N and followed a bearing of ~080° for ~2 km. We initiated the transect by traveling due south through a lava channel to orient

ourselves relative to the sidescan imagery. Between the multiple channel strands that originate at the AST, hackly crusts of broken lobate are present and correspond with highly specular acoustic textures in the DSL120a data. We followed the channel down-flow to an area where several channel strands are abruptly terminated. The channels appear to have been covered, at this location, by a ridge of hackly material ~2-3 m in height. The ridge is reminiscent of levees that are sometimes present at the edges of channels and parallel to the flow direction, but the observed feature is oriented orthogonal to the flow direction. Two SM2000 survey lines were run at 10 m altitude in order to image the hackly ridge. We traversed to the north for ~300 m in order to investigate an acoustic contact between highly specular terrain that we had identified as hackly flow and smoother terrain that we interpreted as lobate flows. We found the contact ~40 m north of its location in the sidescan imagery, indicating a southward navigation shift is required in the sidescan data. Across the contact, we found very low relief lobate flows. The lobate flows were unequivocally produced during the new eruption and had numerous *kipukas* of older lava poking through. A sample was collected within the lobate terrane. There is no channel visible in the sidescan imagery for the next 500 m down-flow, and we found hackly sheet flows covering this area. Upon reentering the lava channel we conducted two N-S oriented photo surveys to further constrain navigational error in the SS data. These surveys crossed three channel strands, each separated by hackly flows. At the southern extent of the photo survey we observed 2005-06 lobate flows, which allowed us to determine that the acoustic contrast between new and old lava in lobate lava flows is quite difficult to determine in the sidescan imagery without correlative bottom observations. We followed the lava channel to the easternmost extent of the sidescan survey, which was coincident with our mapped extent of the eruption. Here, it was difficult to determine where the new flow ended. It appears that the distal ends of the flows are more sedimented than the proximal portions. We identified two possible locations where the flow ended, each marked by a hackly ridge (flow toe?) ~3 m high, overlying a more heavily sedimented sheet flow. Samples were collected at each ridge. A total of 16 samples were collected on transect B over a distance of ~2 km and an elevation change of 53 m.

Acknowledgments

We thank the Jason2 operations group of the WHOI National Deep Submergence Facility (NDSF) and the officers and crew of R/V Atlantis for their excellent support during the survey and recovery operations on AT15-17 in general, and specifically for Dive 268. Program managers at the National Science Foundation and shore-based support personnel at WHOI Marine Operations and NDSF were instrumental in funding and organizing the logistics for the 3 day EPR ISS survey, and we are grateful for this opportunity to collect data that will benefit both the Ridge2000 program and the EPR ISS community of researchers.

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Soule, S.A., D.J. Fornari, M.R. Perfit and K.H. Rubin, How large is a Mid-Ocean Ridge lava flow?: 2005-2006 Eruptions at the East Pacific Rise 9° 46'-56'N, *Geology*, (submitted).

Tolstoy, M., Cowen, J.P., Baker, E.T., Fornari, D.J., Rubin, K.H., Shank, T.M., Waldhauser, F., Bohnenstiehl, D., Forsyth, D.W., Holmes, R.C., Love, B., Perfit, M.R., Weekly, R.T., Soule, S.A., and Glazer, B., 2006, A sea-floor spreading event captured by seismometers: *Science*, v. 314, p. 1920-1922.

Appendix 1 - AT15-17 Jason2 Dive 268 (EPR ISS Infrastructure Dive) Watch Leader Log

April 18, 2007 GMT

0530 Predive for Jason 2D268 on EPR crest near 9° 50'N for EPR ISS infrastructure work

0600 Launched Jason2 at site of OBS212

0727 Sent 'A' command to turn keep transponder net turned ON, at 12 m altitude making bottom approach

0731 Doppler reset to Jason LBL

0739 ~45 m from OBS212 surveyed site at 2508 m using the 10.0/10.5 (B/C) pair

0745 Start searching for OBS212

0810 Checked range on OBS212, says slant/range - depth of instrument is 2542 m (we are positioned directly over it so SL should = depth), suggesting it is further to the west of the surveyed site

0812 Jason2 altimeter and Medea altimeters are OFF so as to not interfere with SM2000 data acquisition

0816 Setting up to do SM2000 calibration – 3 lines each at 5 m, 10m, 15m, on exact reciprocal courses in closed loop

0820 Reset Doppler to Jason LBL

SM2000 CALIBRATION

0821 SOL-1 SM2K Calibration line01 at 5 m alt, 0.5 m/sec speed (1 kt) heading west on 25 m long line in closed loop control

0822 EOL-1- SM2K calibration

0824 Turning to set up for line 2

0825 Turned off downlooking digital still camera

0826 SOL-2 SM2K Calibration line#2, heading 090 at 10 m alt

0828 EOL-2, turning to start line 3

0839 SOL-3 SM2K Calibration Line #3, at 15 m alt (~1 kt)

0831 EOL-3 SM2K Calibration Line#3, turning for line 4

083130 SOL-4 SM2K Calibration Line#4, at 15 m but at ½ kt speed

083345 EOL-4 SM2K Calibration Line#4, finished with SM2K calibration runs.

0836 Heading back to bottom to search for OBS 212

0849 Moving ship 40 m to west

0911 DVL snap of screen, continuing to west of surveyed position, range on ORE deck box to OBS says 2541 m slant range

0928 Moving ship east to continue grid search

1000 Range on deck box opened (got larger) as we moved east, suggests OBS is to west of surveyed position, have turned on downlooking camera at 15 sec while doing search pattern at ~ 3-4 m alt.

1018 Continuing search to east to box out that terrain to make sure it's not east of us

1030 Tried ranging on OBS, still suggests to the west of surveyed position

1053 Set up toplab Benthos 455 to ping at 11 and listen at 13 kHz on Jason to try to box in OBS212, returned not synched but looking for difference in travel time to see when we are closing in on it, running N-S and E-W lines

1102 Moving ship to SW

1121 Continuing to move ship/vehicle to SW of surveyed position as that seems to be closing the range

1216 Continuing to move ship/J2/Medea to SW, now ~ 125 m SW of surveyed position

1220 Adam spotted OBS212, it is ~ 150m SW of surveyed position, setting up to inspect, release, recover it. Lots of DVCAM video of salvage operation

1305 Picked up sample (**J268-01**) from hackly sheet flow at site of OBS212 during recovery operations. Local flat sheet flows are 2-3 m across. Relief up to 1 m around OBS site.

1415 OBS212 on deck, washed down and secured

1433 In tow mode to ROKA1 sampling position at 0.9 kt

1512 On bottom, hackly flow.

1515 Sent A command to keep transponders turned on

1517 Sampled hackly/folded sheet (**J268-02**) at 1517. Sample in Y2A, but small fragments in Y2B and Y2C.

1532 In SS channel, ropey sheets on bottom with very little relief.

1538 Now in flat sheet. Slowed ship to 0.2 kt at 50 m range (Jason to target). Otherwise have been going at 0.4 kt.

1541 Sampled lobate crust (**J268-03**) at 1541. Flat sheet of crust in Y2D.

1543 Lobates with older lava sticking through (kipukas).

1548 Out of lobates, into hackly sheet.

1550 Coming into drained channel from S. Lineations oriented SW-NE.

1555 Following flat sheet (DVCAM).

1604 Sampled folded/hackly crust at N-margin of lava channel (**J268-04**) at 1604. Sample is in Y4B. Lost bottom lock, so Doppler position is bad. Cursor at actual position is more accurate: 9˚50.7226'N 104˚17.7307'W

1618 Lineated sheet with collapsed lobates at the margin.

1628 Sampled lobate crust (**J268-05**) at 1625. Sample in Y2C. Small fragments in Y2D.

1630 Starting AST photo survey. AST is ~17 m deep and 65 m wide.

1646 Setting up for AST SM2000 run at constant depth across AST

1648 Running SM2K line at 2500 m depth E to W at 9 50.79'N at ~1/2 kt across AST

1700 End of AST cross line, now heading NNW to install Benchmark #1 near Biovent area

1702 Heading 340 up West side of AST along rim.

1713 Continuing north at 342 heading

1726 ~100 m from Benchmark #1 site

1730 About 50 m from intended drop site for Benchmark #1

1735 End of traverse line to the north

1742 Reset Doppler to Jason LBL

1748 Benchmark #1 deployed on lobate 2005-06 lava flow at X=4207 Y=79088 (9° 50.9068'N 104 17.7035'W). NB- this position taken from virtual van and is NOT considered to be the final surveyed/calculated position based on LBL data collected, but it is within ~ 5-10 m of what I expect the surveyed position to be.

1754 Rock placed in milk crate of Benchmark #1 to weight it down

1755 Using A/B transponder pair (11.5/10.0) E-W baseline

Benchmark #1 LBL Survey

1756 Start recording LBL data while sitting at Benchmark #1 for 15 min with Jason heading 000° and benchmark at middle of basket

1821 End recording LBL at Benchmark #1, reset Doppler to Jason LBL

Preliminnary position from renav is: 9 50.981'N 104 17.666'W, X=4274 Y=79225
Depth 2504m

Benchmark #1 SM2000 Surveys

1823 Photo of Benchmark #1 in downlooking camera

1836 Start Running photo traverse at ~ 4 m altitude heading 080 to east AST rim

1843 End of photo traverse across AST at Benchmark #1 site

1850 SOL-1, Benchmark #1 across axis SM2000 survey at 2490 m constant depth at .4 kts speed, o/c 260

1908 EOL-1, Benchmark #1 across axis SM2000 survey, moving 10 m north to run next line to the east, expect ~ 40 m swath at 15-20 m altitude

1910 SOL-2, Benchmark #1 across axis SM2000 survey

1926 EOL-2, Benchmark #1 across axis SM2000 survey, stepping 10 m to north

1928 SOL-3, Benchmark #1 across axis SM2000 survey, heading 260

1945 EOL-3, Benchmark #1 across axis SM2000 survey

1946 SOL-4, Benchmark #1 across axis SM2000 survey, running tie line to cross west end of 1st two lines and go over benchmark #1 again at ~ 5 m altitude

1953 EOL-4, Benchmark #1 across axis SM2000 survey, just passed over Benchmark #1 and took downlooking digital photo of it

1955 SOL-5, Benchmark #1 across axis SM2000 survey, heading 080 on last line

2005 EOL-5, Benchmark #1 across axis SM2000 survey, now lining up for transit line down AST to OBS 206 site

2008 Ship/Jason/Medea lined up on AST axis and running at 0.6 kts at 2495 constant depth

2009 Start of transit line from Benchmark #1 survey area to OBS 206 site, heading 170

2015 Heading 170, just passed over Biovent

2135 Ended transit line to the south from Benchmark #1, now pulled off AST to east to find OBS 206 and recover.

2144 Changed autodepth to run 10 m off bottom to OBS site

2152 Had to stop ship because course changed was made at too fast ship speed

2210 changed basline to A/B clockwise

2200 Located OBS 206, commencing recovery operations – on DVCAM

2242 **Sample J268-06,** hackly crust ~ 1 m from OBS 206 site from on top of grate, in stbd swing arm, outboard crate

2250 OBS 206 released.

2301 Transiting north over lobates in new flow

2308 found book pages on seafloor, dropped Target 123 in DVLNAV

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0015 OBS 206 on deck

0119 Nearing end of SM2K survey line up E. Wall of AST

0122 Backing down to stop Medea

0124 End of SM2K line

0142 At Tica, going to head E to install benchmark#2

0147 Heading E to AST wall

0158 Landed at BM2 site.

0204 Reset doppler to Jason LBL (x=2501.2,y=78156.1).

0208 Added weight to BM2 basket

Benchmark #2 LBL Survey

0209 Start collecting 15 minutes of LBL fixes at Benchmark #2.

0224 End LBL data collection for 15 minutes at Benchmark #2

Preliminnary position from renav is: 9 50.401'N 104 17.473'W,
X=4627 Y=78157
Depth 2501m

0225 Starting photo transect at BM2/Tica. 10 second rep rate on images. Heading 270°T.

0234 DLOG2 (event logging machine) crashed. Restarting.

0239 Reached W wall of AST.

0240 Completed photo survey, end of survey shows channel (lineated sheet) extending W from the AST margin. I think it is at the breakout site.

0302 At elevator

0305 Sitting at elevator

0321 took a sample for Mark Kurz, NB - **THIS IS NOT THE SAMPLE RECOVERY SITE, IT WAS LEFT ON THE JASON BASKET – A LARGER SAMPLE WAS COLLECTED ON SUBSEQUENT ELEVATOR VISIT – FROM INSIDE AST NEAR TICA VENT**

0322 Sent A command to keep transponders turned on

0348 Turned elevator camera on – strobes not firing (on recovery it was determined that there was a failure in the strobe cable from the switch to the battery)

0351 Basket exchange at elevator. Yellow basket put on elevator. And picked up Benchmarks 3 and 4.

0355 Red basket on Jason.

0455 Heading to Tica vent to drop elevator

0512 ~ 50 m from Tica vent area

0530 Reset Doppler to Jason LBL

0547 u/w to Benchmark #3 site and Bio 9

0608 at Bio9 ventr, DVCAM of vent

0634 positioning west of Bio9 vent to establish W wall of AST – much too collapsed – will transit east now too deploy benchmark over east wall – but will do photo traverse across AST now to save time.

0649 Benchmark #3 photo traverse at 4 m from west to east across Bio9 vent site

0702 Deploying Benchmark #3 east of AST rim at latitude of Bio9 vent

0709 Getting rocks to put in benchmark milk crate to weight it down

Benchmark #3 LBL Survey

0714 Start collecting LBL data while sitting at Benchmark #3 site with J2 at 000 heading and benchmark at front of basket

0730 End LBL data collection at Benchmark #3 site.

Preliminnary position from renav is: 9 50.308'N 104 17.464'W,
X=4643 Y=77986
Depth 2501m

0736 Reset Doppler to Jason LBL

Benchmark 2&3 across axis SM2000 Survey

0743 SOL BM2-3 Line 1 , cross line at ½ kt from E to W.
0820 reset Doppler and switched baselines to B/C (10.0/10.5) pair
0840 EOL BM2-3-1
0848 SOL BM2-3-2 (west to east)
0903 EOL BM2-3-2
0906 SOL BM2-3-3 (east to west)
0918 EOL BM2-3-3
0921 SOL BM2-3-4 (west to east)
0936 EOL BM2-3-4
0939 SOL BM2-3-5 (east to west)
0957 EOL BM2-3-5
1001 SOL BM2-3-6 (west to east)
1017 EOL BM2-3-6
1021 SOL BM2-3-7 (east to west)
1037 EOL BM2-3-7
1042 SOL BM2-3-8 (west to east)
1103 EOL BM2-3-8
1107 SOL BM2-3-9 (east to west)
1125 EOL BM2-3-9
1130 SOL BM2-3-10 (west to east)
1151 EOL BM2-3-10
1156 SOL BM2-3-11 (east to west)
1211 EOL BM2-3-11
1216 SOL BM2-3-12 (west to east)
1241 EOL BM2-3-12
1244 SOL BM2-3-13 (east to west)
1259 EOL BM2-3-13

1302 SOL transit between Benchmark 3 and Benchmark 4
1332 EOL transit line, now looking for Ty/Io vents to install Benchmark #4
1338 Coming into Ty/Io vent area
1342 DVCAM of Marker #12 (Ty vent) area
1350 DVCAM of hiT logger #30 at Io vent
1358 Moving between Ty and Io vents, distance between the two is ~ 8 m with Ty being north of Io. Ty is venting from basalt rubble on top of tumulus in AST floor, while Io is a small ~2m tall chimney with ~ ½ m of chimney above the logger position that was inserted in Nov. 2006 on AT 15-13 (Von Damm) cruise.
1359-1401 W to E traverse over Marker #12 (Ty) vent
1413 at Benchmark #4 site ~ 20 m from east wall of AST at latitude of Ty vent
1414 Reset Doppler to Jason LBL
1423 Setting up at Benchmark #4 site
1439 Sent A command to transponders to keep them turned on

Benchmark #4 LBL Survey

1440 Start 15 min LBL recording at Benchmark #4 with Jason2 oriented 000 and benchmark at front of basket.

1455 End recording of LBL at Benchmark #4

Preliminnary position from renav is: 9 50.126'N 104 17.428'W, X=4710 Y=77650
Depth 2503m

1457 Reset Doppler to Jason LBL

1459 Start photo traverse across from E to W wall of AST at 3-4 m altitude over Benchmark #4 site.

1518 End photo traverse at Benchmark #4 site

1529 Near start of Benchmark #4 across axis survey line 1 from W to E ~ 80 m north of Ty/Io area, will do surveying at 2490 m constant depth

Benchmark 4 across axis SM2000 Survey

1531 SOL BM4-1 (west to east) (Biomarker #4 area survey line 1)
1549 EOL BM4-1
1555 SOL BM4-2 (east to west)
1615 EOL BM4-2
1622 SOL BM4-3 (west to east)
1638 EOL BM4-3
1642 SOL BM4-4 (east to west)
1658 EOL BM4-4
1705 SOL BM4-5
1720 EOL BM4-5
1726 SOL BM4-6
1745 EOL BM4-6

1747 start transit to OBS 210 site from Benchmark #4 at 0.6 kts and 2490 m constant depth.

1845 End transit to OBS 210

1850 At OBS 210 site – very buried… going to attach float and then try to break through some of the lava crusts

1930 At OBS 210 site working on recovery – looks unlikey

2015 Giving up on recovery of OBS

2022 Doppler reset to Jason LBL. Will commence long N-S lines for survey to cover AST between 9 50-51'N. First line will start as a cross line from OBS 210 site to the west side of the AST, then line 2 will be first N-S line.

N-S SM2000 survey of the AST between ~ 9 50'51N

2025 SOL (AST1), W to E. 9°49.632'N, 104°17.403'W, 0.3 kt to start, auto depth at 2490.

2033 EOL (AST1), 9°49.632'N, 104°17.349

2036 SOL (AST2), E to W. 9°49.635'N, 104°17.350'W. Starting slow, getting up to 0.6 kt.

2136 Arrived at official start of survey, 9°50.069'N, 104°17.407'W

2138 2° heading correction to get back under Medea.

2152 Note: Turned off DVDs as we will be out of bottom visual range, so remember to start new DVD's for sampling transect.

2158 Changed baseline to BC clockwise.

2228 Switched to AB baseline CCW.

2230 Reset doppler to Jason LBL.

2313 EOL (AST2) 9°51.016'N, 104°17.626'W (1:45 total for first line).

2344 SOL (AST3) 9°51.016'N, 104°17.636'W (30 min for turn).

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0043 Changed LBL baseline to BC CW.

0117 Reset doppler to Jason LBL.

0129 EOL (AST3), 9°50.093'N, 104°17.429'W. Ended line early because heading straight for LDR mooring. Coming off bottom to avoid mooring.

0140 Stopping ship. Bridge is fixing heading for next line.

0154 getting lined up for start of AST4

0157 SOL AST4 (south to north)

0200 Sent A command to keep transponders on

0214 Jog to west in line, Jason getting pulled by Medea, throughout the survey there have been bottom currents that have been problematic in driving medea to where Jason needs to be for the line

0354 EOL EOL AST4, at north end of survey area, will set up to run line AST 5, will run it outboards- to the west- of all other AST long lines and then fill in with line 6, all lines run at constant depth of 2490 m, bottom lock excellent, only lost momentarily in a few instances.

0413 SOL AST 5 (north to south)

0609 EOL AST 5

0626 Doppler reset to Jason LBL

0625 Switched to A/B xponder baseline

0633 SOL AST 6 (south to north)

0831 EOL AST 6, now maneuvering to do lava channel work at 9 51'N lava channel east of AST

0840 Reset doppler to Jason LBL

0846 Heading to start of sampling transect in AST.

0850 Looking at AST collapse (DVCAM).

0857 Reset doppler to Jason LBL

0902 Sampling lobate crust (in place) from AST margin (**J268-09**) at 0908. Sample in R2A.

0910 Traversing channel, it appears to be properly aligned with sidescan.

0914 Reset doppler to Jason LBL.

0915 Edge of channel is hackly and folded.

0917 Outside of channel is rough, broken lobate.

0920 Sampling ropey folds at ROKB1 (**J268-10**). Sample placed in R2B, glass chunk fell in R2D at 0922.

0926 Reset doppler to Jason LBL.

0929 Lineations in sheet flow oriented 57˚, lineations turn to 105˚.

0941 Still in channel on SS, but we are moving through hackly flow.

0944 Watch change. Local area of lobate at edge of channel.

0948 Lineations oriented 157˚T. We are probably following southern limb of channel (SS offset to south?). DVCAM.

0959 Sampled ropey fold in channel (**J268-11**) at 0959. Sample in R1A. Lineations in channel are E-W.

1003 Explore to the N. Found edge of channel. Appears to get hackly and high (1-2 m) relief.

1006 Small area of pillows and lobates. Catching edge of bright reflector between channels??

1013 More lobates. Lineations no longer present.

1019 Coming into channel. Hackly/folded lava at the margin. Lineations E-W.

1023 Lens of hackly material in channel is 2 m high.

1027 Back in channel (E-W lineations).

1036 At rise blocking channel. Appears to be a large pile of hackly material, striking 136. Possibly a levee from an earlier flow pulse? Looks like it is on top of sheets.

1042 Sampling hackly levee (**J268-12**) at 1044. Sample is in R3A.

1048 Going to run a couple of SM2K lines across hackly ridge.

1053 Heading 200, altitude of 10 m, Start of survey.

1058 SOL (Ridge1)

1105 EOL (Ridge1)

1107 SOL (Ridge2)

1115 EOL (Ridge2)

1116 On bottom, in fresh hackly flow. Heading towards acoustic contact (hackly/lobate?).

1118 There is a sheet flow N of the hackly ridge. Small in extent. Mostly hackly.

1123 Traversing hackly flow.

1129 Found hackly/lobate contact. Lobate flow is thin with many kipukas.

1132 Sampling lobates near kipuka (**J268-13**) at 1138. Sample in R3B. Sample broke in 3 pieces when placed in basket.

1155 Still in lobates. More pillow like lava forms though. Maybe a flow front?

1201 Surprisingly, not into hackly flows yet (SS offset). Still pillows.

1203 Pillow to lobate transition.

1204 Deep collapse (1-2 m).

1209 Into hackly flow. Lumpy, 1 m relief.

1214 Sampled hackly flow at 1214 (**J268-14**). Sample in R2C.

1217 Continuing through hackly flow at 0.4 kt to next sampling point.

1228 Still in hackly flow, slightly more sediment cover??

1234 Reset doppler to Jason LBL.

1234 DVCAM hackly flow.

1241 Hackly flow pile with steep sides (~1 m high).

1251 Sample (**J268-15**). Chunk of hackly flow at 1251. Sample place in R3C and small chunks fell in R3A and R3D.

1259 Hackly to sheet transition. Sheet is on top of hackly. It appears that hackly flow is bulldozing sheet and breaking it up in the process.

1304 In channel. Lineations oriented E-W.

1310 Back into hackly flow, skirting edge of channel?

1330 Collected sample (**J268-16**) of fold of hackly flow from edge of channel at 1324. Sample placed in R1B.

1353 Stopped Northern photo traverse, starting southernly photo traverse. In auto altitude at 3ish m.

1406 Coming into N channel (Tgt 138), out of channel (Tgt 139), back into channel (Tgt 140), end of channel (Tgt 141). Break in channel of hackly flow between 139-140.

1420 Coming into suther channel. Southern margin of channel bound by lobate. Cutting off photo survey without reaching end of flow. Flow extends to the south as lobate.

1451 Ending photo traverse and starting SM2K line to the north across channels.

1456 Reset doppler to Jason LBL.

1457 Started northerly SM2K line.

1534 Heading correction to 025˚T

1541 EOL in black patch.

1543 On bottom. In broad, flat sheet.

1556 Sampled fold in sheet flow (**J268-17**) at 1553. Sample in port swingarm, outboard box.

1559 Sheet flow lineations at 270˚ (E-W).

1601 DVCAM, contact between sheet and hackly flow (towards AST). Hackly flow bulldozing sheet.

1603 Sampling hackly flow with scoop.

1611 Sampled fold of hackly flow with triangular scoop (**J268-18**). Sample in port swing arm, outboard box.

1620 Going over hackly flow from what looks like bright backscatter mitten shaped promontory in SS.

1631 Very flat sheet.

1634 Swirl.

1645 Sampled from raised blister in sheet flow. Nice flat crust with white edges (**J268-19**). Sampled at 1642 and placed in R4A.

1648 Very flat sheet. Light, along-channel bands in SS are elongate piles of thin-crusted hackly flow.

1656 Following channel, very flat with lineations at 56˚.

1706 Out of channel into ropey folded sheet into hackly.

1713 Sampled crust from hackly flow at N-edge of channel (**J268-20**) at 1710. Sample placed in starboard swingarm, inboard basket.

1713 Reset doppler to Jason LBL.

1715 Moved weights from basket.

1720 Occasional push up ridge (small) oriented normal to flow direction.

1724 Occasional kipukas in hackly flow show sediment. Hackly flow must not be too thick, at least in places.

1728 Occasional intact sheet in hackly flow. Looks like a waterslide, i.e., curvy, narrow cylinder (see drawing in notes).

1739 Hackly crust sampled at 1739 (**J268-21**). Flattish, square plate from hackly flow placed in R2D. Crumbled a bit when placed in bin.

1744 Reset doppler to Jason LBL.

1748 DVCAM on over hackly flow with occasional sheet areas.

1751 Reset doppler to Jason LBL.

1755 End DVCAM segment. Going over hackly to small sheet area.

1807 Lobates with 1-m deep collapses.

1809 Sampled hackly crust (**J268-22**). Sample placed in R2B.

1817 In hackly flow, looks more sedimented, but is still new.

1837 Sampled hackly crust at end of flow (**J268-23**) at 1834. Sample in R2D. Broken in many pieces. Large pieces shoved behind basket.

1838 Reset doppler to Jason LBL.

1839 Turning around and heading back to first location of possible end of flow.

1849 Sampled hackly flow front (**J268-24**). Front is ~2 m high and sits on top of a sedimented sheet that looks older. Sample placed in port swingarm, inboard basket.

1850 End of lava channel sampling transect. Heading to elevator.

1900 getting set up to transit to elevator at ~ 15-20 m altitude and 0.7 kts

1910 SOL from end of channel to elevator site recording SM2000 data

2000 ~ 1500 m from elevator

2118 ~ 50 m from elevator, turned south and will cut top two BM2-3 cross axis survey lines for tie lines

2122 EOL from channel to elevator

2135 SAMPLE #25 (**J268-25**), a large lava crust from next to elevator was put in the Kurz sample chamber and scraped with the stbd manip so glass fell into the chamber, then it was sealed. The large sample was put into the Benchmark #10 milk crate that was not deployed and will be returned to the surface w/the elevator. 2514 m, 9 50.399'N 104 17.507'W

2142 Reset Doppler to Jason LBL

2220 Elevator released to surface

2245 At Benchmark #2 site to collect additional LBL data

2251 Problems with Jason 2 LBL, when shut down so we could track elevator

2305 Jason1 LBL nav back on and collecting data while in position at Benchmark #2

2320 End LBL nav collection at Benchmark #2

Preliminnary position from renav is: 9 50.409'N 104 17.478'W,
X=4619 Y=78171
Depth 2501m
*****note that this position is off by ~ 15-20 m from previous position – data from survey need to be processed prior to establishing a 'surveyed position' for each benchmark**

2312 Tracking elevator

April 21, 2007

0030 Elevator on deck, heading to Bio9, P and Ty/Io vent areas for visual observations and imaging using DVCAM and 3-chip

0030 to 0230 – during visits to hiT vents the SM2000 was inadvertently turned off and when it came back on it was reversed – this was fixed at 0235

0235 SM2000 system now recording properly

0324 Reset Doppler to Jason LBL

0325 Started collecting LBL data at Benchmark #4 using B/C pair (10.0/10.5)

0342 End LBL data collection at Benchmark #4 with B/C pair

0343 Started collecting LBL data at Benchmark #4 using A/B pair (11.5/10.0)

0358 End LBL data collection at Benchmark #4 with A/B pair

0400 o/c 177 going 450 m to get past LADDER mooring to start survey box of the AST south of ladder moorings between ~ 9 49.5'-48'N

0402 Reset Doppler to Jason LBL

0405 Increase speed to 0.6 kt, running at 2490 m constant depth

0419 Adam coming on watch, setting up for SM2K survey.

0437 SOL (ASB-1) Heading 170˚

0524 EOL (ASB-1) 9˚49.483'N, 104˚17.350'W. 20 m west of intended target.

0537 Reset doppler to Jason LBL

0539 SOL (ASB-2) 9˚49.485'N, 104˚17.364'W

0552 Fixed SM2K. It was setup improperly (not using the external ducer) after crashing. As a result, less power and narrower swath width, although still covered the 90˚ swath we are using.

0641 EOL (ASB-2) 9˚49.878'N, 104˚17.418'W

0644 Changed survey plan due to poor line placement and ducer problem. Will run line to the south between first two lines to fill in gap at north of survey. Will cross over first line (crossing it to the east) in order to catch the E-edge of the AST.

0655 SOL (ASB-3) 9˚49.868'N, 104˚17.418'W

0658 Doppler reset to Jason LBL

0712 o/c 170 at 0.6 kts running ASB line 3

0749 EOL (ASB-3), start transit to compliance meter

0757 SOL transit to compliance meter at 2490 constant depth heading SW

0951 ~ 500 m from compliance meter with Jason2, 0.7 kts o/c 216

0955 Doppler reset to Jason LBL using 10.5 and 9.5 pair

1002 EOL transit to compliance meter

1005 3 m altitude ~ 200 m from compliance meter, taking ESCs

1019 Reset Doppler to Jason LBL

1025 At compliance meter,

1040 Cutting weight burn wires

1053 Compliance meter released to surface

1302 Compliance meter recovered, Jason surfacing, End of Lowering

1353 Start Maggie spin at 1200 m depth, CCW, 3 spins through 360 deg at 3 min each

1404 Start Maggie spins CW (3 spins)

1411 End Maggie spins – continuing to surface

1518 Jason2 on deck- END OF DIVE

Appendix 2 – SM2000 Processing Notes from C. Sellers and Preliminary Images of Data

AT15-17 J2-268 SM2k Surveys – C. Sellers (WHOI – DSOG Data Processor)

During J2-268 SM2000 data was collected at all times except for one short period from ~Apr21,2007- 00:35 - Apr21, 2007- 01:33. From the Nav log, Events and Lowering Summary the following survey times were determined.

The raw data is provided on various cruise Data-DVD's. See the cruise spreadsheet for details. These files were processed using *smb_batch.m* and the resulting *.mat* files are included here. They are in 2 parts. The main part is here (*sm2k/*) and the rest are in *part2/* (on another DVD). With these two sets of *.mat* files the files *file_index.mat* and *sonar_configs.mat* are included and are important for further processing. Each of the two pieces of data set has its own version.

SM2000 *bathy_plot* processing was performed using both *nav_t* and *renav* navigation for these surveys and the results are contained in directories corresponding to the name in the table below with the *nav_t* results in a subdirectory of that name. Dot cloud and XYZ files as well as a summary plot (in most cases) are provided.

Location	**Name**	**Date**	**Start**	**End**
At Benchmark 1	bench1	April 18, 2007	18:23	20:05
At Benchmark 2 and 3	bench2_3	April 19, 2007	07:43	12:59
At Benchmark 4	bench4	April 19, 2007	15:31	17:45
Long N-S AST Line*	ns_ast	April 19-20, 2007	20:25	08:31
(* NB- too big: in 2 parts ns_ast1 & ns_ast2)				
AST S of LADDER mooring	s_ast	April 21, 2007	04:37	07:49
(NB - this one will not process?)				

Additional lines	**Name**	**Date**	**Start**	**End**
Calibration	calib	April 18, 2007	08:19	08:37
Transit 1	transit1	April 19, 2007	17:51	18:45
Lava Channel	lava1	April 20, 2007	09:02	11:15
Maybe Lava Channel	lava2	April 20, 2007	14:57	18:50
Transit 2	transit2	April 20, 2007	19:02	21:22

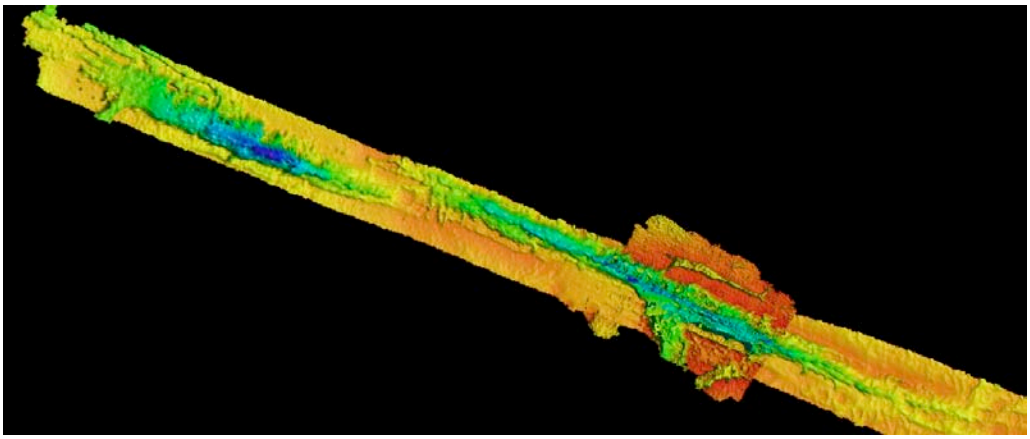
Note: The N-S AST survey was too large for the machine and was broken into 2 parts. Part 1 seems to have a few bad beams that made the plot useless to look at.

Note: the Southern AST survey will not process due to some nav glitch I couldn't figure out.

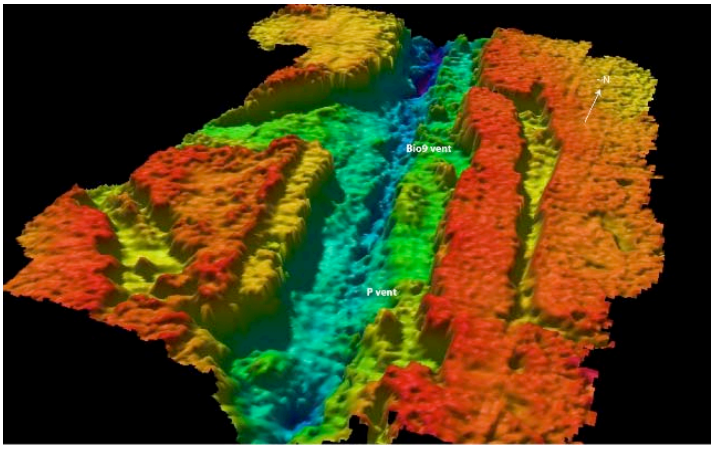
Note: the first survey was a calibration survey. The results of processing this calibration data produced offsets of: .25, 1, 1.5, which were used during 'bathy_plot' processing.

The code used to generate these results is included with the data in the directory called: "sm2k_proc_at15_17/"

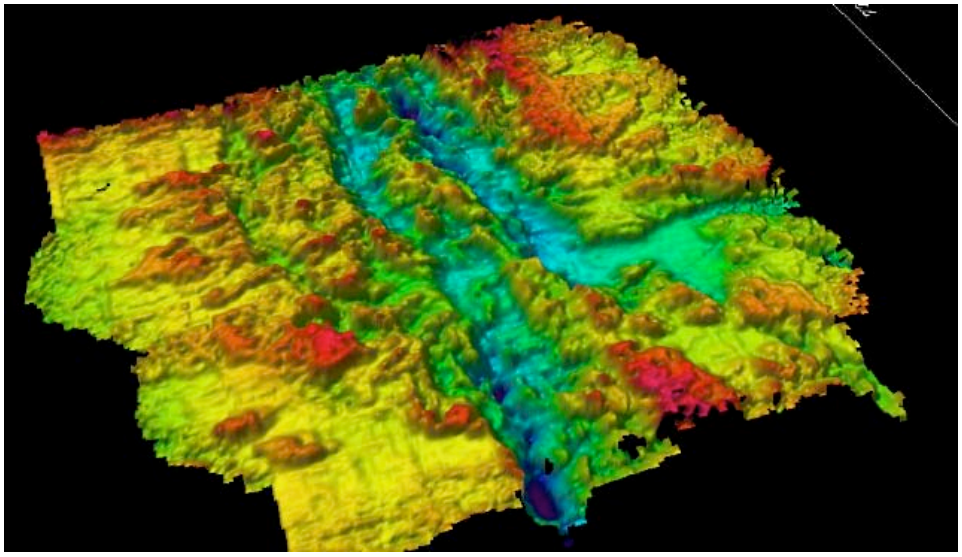
Appendix 2 – SM2000 Processing Notes from C. Sellers and Preliminary Images of Data



Appendix 2- Figure 1 – IVS Fledermaus image of SM2000 data collected on the long survey lines between Benchmarks 1 and 2-3. North is to top-right of image. 2 m pixel data.



Appendix 2- Figure 2 – IVS Fledermaus image of SM2000 data collected during Benchmarks 2-3 surveys. North is to top of image. 1m pixel data.



Appendix 2- Figure 3 – IVS Fledermaus image of SM2000 data collected during Benchmarks 4 surveys. North is to top-left of image. 0.75 m pixel data.